}essentials{

Renate Motzer

Fractions, Ratios, and Roots

Rediscover the Basics and Learn About Interesting Applications



essentials

Springer essentials

Springer essentials provide up-to-date knowledge in a concentrated form. They aim to deliver the essence of what counts as "state-of-the-art" in the current academic discussion or in practice. With their quick, uncomplicated and comprehensible information, essentials provide:

- an introduction to a current issue within your field of expertis
- an introduction to a new topic of interest
- an insight, in order to be able to join in the discussion on a particular topic

Available in electronic and printed format, the books present expert knowledge from Springer specialist authors in a compact form. They are particularly suitable for use as eBooks on tablet PCs, eBook readers and smartphones. *Springer essentials* form modules of knowledge from the areas economics, social sciences and humanities, technology and natural sciences, as well as from medicine, psychology and health professions, written by renowned Springer-authors across many disciplines.

More information about this series at http://www.springer.com/series/16761

Renate Motzer

Fractions, Ratios, and Roots

Rediscover the Basics and Learn About Interesting Applications



Renate Motzer Augsburg, Germany

ISSN 2197-6708 ISSN 2197-6716 (electronic) essentials
ISSN 2731-3107 ISSN 2731-3115 (electronic)
Springer essentials
ISBN 978-3-658-32573-2 ISBN 978-3-658-32574-9 (eBook) https://doi.org/10.1007/978-3-658-32574-9

© Springer Fachmedien Wiesbaden GmbH, part of Springer Nature 2021

The translation was done with the help of artificial intelligence (machine translation by the service DeepL.com). A subsequent human revision was done primarily in terms of content.

This work is subject to copyright. All rights are reserved by the Publisher, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, reuse of illustrations, recitation, broadcasting, reproduction on microfilms or in any other physical way, and transmission or information storage and retrieval, electronic adaptation, computer software, or by similar or dissimilar methodology now known or hereafter developed.

The use of general descriptive names, registered names, trademarks, service marks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use.

The publisher, the authors and the editors are safe to assume that the advice and information in this book are believed to be true and accurate at the date of publication. Neither the publisher nor the authors or the editors give a warranty, expressed or implied, with respect to the material contained herein or for any errors or omissions that may have been made. The publisher remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Responsible Editor: Iris Ruhmann

This Springer imprint is published by the registered company Springer Fachmedien Wiesbaden GmbH part of Springer Nature.

The registered company address is: Abraham-Lincoln-Str. 46, 65189 Wiesbaden, Germany

What You Can Find in This essential

- What fractions "are" and how to calculate with them
- Why in some contexts fractions stand for parts and in others for ratios
- How fractions and decimal numbers relate to each other
- Why there are also numbers that cannot be expressed as fractions (so-called irrational numbers)
- Why it is so important for percentages to know what the basic value is
- Why different types of averages are sometimes needed in different contexts

Contents

1	Intro	duction	1
2	Wha	t Are (Common) Fractions?	3
3	Frac	tions as Parts of a Whole	5
	3.1	The Whole as a Circle or Rectangle?	5
	3.2	Addition and Subtraction of Fractions	7
	3.3	Multiplication and Division	8
	3.4	Sample Exercises for Skimming	10
4	Frac	tions as Ratios	13
	4.1	The Ratio Aspect of Fractions	13
	4.2	The Miraculous Multiplication of Areas	16
	4.3	The Simpson Paradox	18
5	Orde	ering Fractions	23
6	Deci	mal Fractions	25
	6.1	Finite Decimal Fractions	25
	6.2	Infinite Decimal Numbers	29
7	Perce	entage Calculations	31
8	Irrat	ional Numbers	35
	8.1	Root Extraction	35
	8.2	The Golden Ratio	37

9	Pro	babilities
	9.1	Probability Approaches
	9.2	Conditional Probability
	9.3	Hypothesis Testing
10	Var	ious Mean Values
11	Con	clusion